

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application:

1-4. (Canceled)

5. (Currently amended) A variable optical attenuator ~~according to claim 1, and~~ comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixelated liquid crystal phase changing element comprises a serial pair of parallel aligned liquid crystals, orthogonally aligned such that said attenuator is insensitive to the direction of polarization of said optical signal.

6. (Currently amended) A variable optical attenuator ~~according to claim 1, and~~ comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixelated liquid crystal phase changing element comprises a serial pair of twist geometry liquid crystals, having the same overall twist angle but with the twist directions reversed, and disposed such that at the transition between said crystals, the mutual alignment of the twist structure is 90° such that said attenuator is insensitive to the direction of polarization of said optical signal.

7. (Currently amended) A variable optical attenuator ~~according to claim 1, and~~ comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixelated liquid crystal phase changing element comprises a liquid crystal divided into at least two orthogonally aligned pixels, such that said attenuator is insensitive to the direction of polarization of said optical signal.

8-11. (Canceled)

12. (Currently amended) A variable optical attenuator ~~according to claim 1, and~~ comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixel is four pixels arranged in opposite quarters of said element, and said drive source is operative to change the phase of light passing through two diagonally opposite ones of said pixels

13. (Currently amended) A variable optical attenuator ~~according to claim 1,~~ and comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixel is an array of a number of strip pixels running across the element, said array dividing said element into approximately equal pixelated and non-pixelated areas.

14-18. (Canceled)

19. (Currently amended) A variable optical attenuator ~~according to claim 1,~~ and comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixelated liquid crystal phase changing element comprises a serial pair of parallel aligned liquid crystals with a half wave plate disposed between them, such that said attenuator is insensitive to the direction of polarization of said optical signal.

20. (Currently amended) A variable optical attenuator according to claim 19, and wherein said half wave plate is operative as a substrate for one of said at least one pixelated liquid crystal phase changing elements.

21. (Currently amended) A variable optical attenuator according to claim 19, and wherein said half wave plate is operative as an alignment layer for one of said at least one pixelated liquid crystal phase changing elements.

22. (Currently amended) A variable optical attenuator ~~according to claim 1, and~~ comprising:

an input fiber for receiving an input optical signal to be attenuated;

an output fiber for outputting said attenuated optical signal;

an optical path disposed between said input fiber and said output fiber, through which said optical signal passes;

at least one pixelated liquid crystal phase changing element, disposed in said optical path such that part of said optical signal passes through at least one pixel of said at least one pixelated element; and

a drive source applied to said at least one pixel, operative to change the phase of that part of said optical signal passing through said at least one pixel,

wherein said at least one pixelated liquid crystal phase changing element comprises a liquid crystal with a quarter wave plate disposed in proximity to said liquid crystal, and also comprising a reflecting surface, and wherein said input fiber and said output fiber are disposed such that light passes by reflection between them.

23. (Original) A variable optical attenuator according to claim 22, and wherein said reflecting surface is formed on the rear side of said quarter wave plate.

24. (Currently amended) A variable optical attenuator according to claim 22, and wherein said quarter wave plate is operative as a substrate for said at least one pixelated liquid crystal phase changing element.

25. (Currently amended) A variable optical attenuator according to claim 22, and wherein said quarter wave plate is operative as an alignment layer for said at least one pixelated liquid crystal phase changing element.

26-46. (Canceled)